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A Review on Ebola Virus Disease and Its Prevention and Management in Community

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ABSTRACT
Ebola virus disease is a devastating hemorrhagic disease that is often fatal, has been plaguing Africa since its initial discovery in 1976. For more than 42 years, the disease has claimed the lives of over 15,000 people, with no significant changes in case fatality rates. However, as the global response to EVD evolves, we continue to learn about better ways to diagnose, treat and prevent this disease. EVD does not naturally occur in the human population; it is introduced after exposure to close contact with the secretions, meat or bodily fluids of animals, such as fruit bats, monkeys or other rainforest animals. The World Health Organization states that 2 negative RT-PCR test results, at least 48 hours apart, are required for a clinically asymptomatic patient to be discharged from hospital. Destruction of other tissue cells results in myalgias from myositis, hepatitis, and acute kidney injury from renal tubular dysfunction. Immune-mediated cell damage causes further injury, leading to dysfunction in multiple vital organs such as the lungs, heart, kidney, and liver. More healthcare programmes are required to conducting a large scale for developing the awareness about Ebola virus disease about preventive measures and eradication process. Extensive research investigations are needed to developed in an accurate diagnostic procedure as well as an affordable and rapid treatment initiatives can control Ebola virus infection.
Keywords: Ebola virus disease, World health organization, Vital organs, Research investigations, Treatment initiatives.

Introduction

Ebola viruses are contagious, lethal viruses that are the causative agents of rare Ebola virus disease. Ebola virus disease, once known as Ebola hemorrhagic fever, can cause oozing from venipuncture sites, melena, hematochezia, hematemesis. However, these manifestations are seen less than 50% of the time. Nonspecific symptoms, including fever, malaise, headache, myalgias, common initial symptoms. Diarrhea, nausea, and vomiting begin a few days later and can be severe. The disease can quickly progress to multiorgan system failure, leading to shock and death.

The overall case-fatality rate is about 40% to 50%. The main variables impacting survival rate are early disease identification and access to healthcare for patient stabilization and supportive medical care, differences in health status (such as nutrition and coinfections), genetic differences, and patient attitudes surrounding seeking medical treatment. Highly transmissible, it can cause large outbreaks, epidemics, and pandemics. Despite outbreak control efforts, the Western African epidemic from 2013 to 2016 affected several countries outside continental Africa. An epidemic can have a devastating global impact on healthcare, the economy, and society. Treatment is mainly supportive; investigational therapies continue to be researched[1-3]. Ebola viruses, filamentous viruses with a characteristic twisted thread shape belonging to the *Filoviridae* family, were discovered in The Democratic Republic of Congo in 1976. *Filoviridae* are negative-strand RNA viruses and derive their name from the Latin word "filum," meaning thread. This viral family most commonly infects humans and primates and is thought to use fruit bats of the *Pteropodidae* family as a natural reservoir. Ebola viruses, named after the Ebola River, emerged in 1976. The viruses appear episodically in animal populations in regions close to the African equator.

They are highly transmissible between humans and primates, including chimpanzees, apes, and gorillas[4-6]. Ebolavirus and Ebola virus antibodies can also be found in bats, which are considered asymptomatic reservoirs. Although bats with Ebola virus antibodies have been discovered in surveillance studies during outbreaks, establishing a causal relationship with human illness remains unproven. Since its discovery, over 25 EVD outbreaks have occurred; many were confined to rural areas in Sudan, the Democratic Republic of Congo, Gabon, the Republic of the Congo, and Uganda. Ebola virus disease has claimed the lives of over 15,000 people. Hunting and eating bushmeat is a risk for contracting Ebola viruses. Transmission in the community from the patient to family and community members and during funeral practices can be rapid.

Transmission

Infected humans and non-human primates transmit Ebola viruses through direct contact with bodily fluids, including saliva, blood, urine, feces, sweat, breast milk, or semen, and contact with objects. The virus usually enters the new host

through mucosal membranes and perhaps skin. It can occasionally happen percutaneously. Ebola viruses can persist in body fluids for prolonged periods. For example, in semen, Ebola virus has been isolated for up to 82 days and detected via PCR up to 101 days after initial symptoms[7-8].

Pathophysiology

Once the Ebola virus infects the host, there is an incubation period of 2 to 21 days, with a mean of 8 to 10 days. The virus penetrates the host cell membrane by binding with $GP_{1,2}$, which triggers endocytosis. Once inside the cell, the virus releases its nucleocapsid into the host cell cytoplasm. VP30 initiates viral RNA replication [32080199] and serves as a regulatory protein; phosphorylation of VP30 by transcribed viral proteins turns off VP30 and ceases viral protein synthesis. Due to this unique function, VP30 has been identified as a target for vaccine development. The matrix protein VP40 is also produced and packaged into exosomes and is involved in host immune system suppression. Virus release from the cell is by budding from the cell membrane; this can cause direct damage to the cell and cell death. EBOV-specific cellular and humoral immune responses develop but are often outpaced by virus-host cell interactions. The process is not fully understood and continues to be investigated. Mononuclear cells are among the cells that are first targeted by the virus. The destruction of these cells results in the release of cytokines and reactive oxygen species responsible for edema and hypovolemic shock. Destruction of other tissue cells results in myalgias from myositis, hepatitis, and acute kidney injury from renal tubular dysfunction. Immune-mediated cell damage causes further injury, leading to dysfunction in multiple vital organs such as the lungs, heart, kidney, and liver. The combined effects lead to multi-system organ failure. Death can occur quickly from the onset of symptoms, often within 6 days. For survivors, long-term consequences have been identified, including hepatitis, encephalitis, uveitis, and spinal cord injury[9-10].

Risk Factors for Ebola Exposure

Direct Contact with Infected Persons: Providing direct care for patients (including family members) in homes or hospitals without appropriate personal protective equipment (PPE).

Burial and Funeral Practices:

Touching the body of someone who died from Ebola is highly infectious.

Animal Contact:

Handling, slaughtering, or eating raw meat from infected animals, particularly fruit bats, chimpanzees, gorillas, monkeys, or forest antelope.

Contaminated Environments:

Touching surfaces, clothing, or bedding contaminated with bodily fluids (blood, feces, vomit, saliva, sweat, semen, or amniotic fluid).

- **Occupational Exposure:**
  Healthcare workers and laboratory staff, or those assisting in burial, are at higher risk if infection control precautions are not strictly followed.
- **Sexual Transmission:**
  Survivors can carry the virus in certain body fluids, including semen, for months after recovery.
- **Travel and Location:**
  Travelling to areas with active Ebola outbreaks and visiting specific locations like mines or caves where bats are present.

Lab test

- **RT-PCR:** Detects viral RNA, usually within 3-10 days after symptom onset. It is highly sensitive and can identify low levels of the virus.
- **Antigen-Capture ELISA:** Identifies specific viral antigens and is used for rapid, often confirmatory, diagnosis.
- **Antibody Test (ELISA):** Detects IgM or IgG antibodies, typically used to identify past infection or immune response, rather than acute infection, as antibodies take 8-10 days to become detectable.
- **Rapid Diagnostic Tests (RDTs):**
- Lateral flow immunoassay tests exist, though they have lower sensitivity than PCR and often require confirmation.
- **Sample Collection:**
- Blood is taken from a vein, and samples must be handled in high-containment laboratories[11-12].

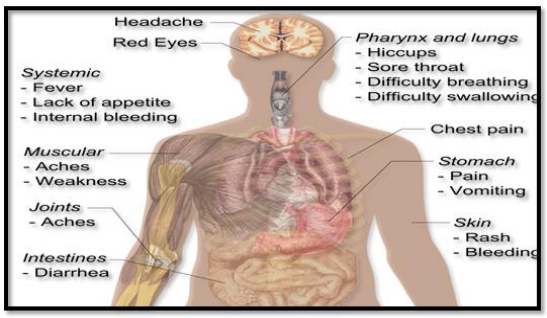

Fig.1 Clinical symptoms

Clinical symptoms

The major clinical symptoms usually begin with a sudden influenza-like stage characterized by fatigue, fever, weakness, decreased appetite, muscular pain, joint pain, headache, and sore throat. The fever is usually higher than 38.3°C (101°F). This is often followed by nausea, vomiting, diarrhoea, abdominal pain, and sometimes hiccups. The combination of severe vomiting and diarrhoea often leads to severe dehydration.

Complications of Ebola virus[13-14]

- Abdominal pain
- Eye pain or redness
- Fatigue
- Headache
- Muscle and joint pain
- Numbness and tingling (peripheral neuropathy)
- Peeling skin
- Vision problems, including blindness, blurred vision and light sensitivity (photophobia)

Management and Treatment

- The monoclonal antibody treatments include:
- Ebanga®. This is a single monoclonal antibody.
- Inmazeb®. This is a combination of three monoclonal antibodies.
- Experts have only tested these treatments in Zaire ebolavirus infections.
- IV fluids to prevent dehydration
- Oxygen therapy
- Pain relievers
- Vasopressors to raise low blood pressure

Prevention and Control Measures

Vaccination: The Ervebo vaccine is used to prevent the Zaire ebolavirus species. A two-dose regimen, Zabdeno and Mvabea, is also approved.

Hygiene Practices: Frequent hand washing with soap and water or alcohol-based sanitizer is crucial.

Avoid Contact with Fluids: Avoid contact with the blood, saliva, vomit, semen, or stool of infected individuals.

Safe Burial Practices:

The bodies of deceased Ebola victims remain highly contagious; safe, dignified, and monitored burials are necessary.

Avoid Animal Reservoirs:

Avoid contact with bats, monkeys, apes, and raw meat from these animals.

Travel Precautions:

Monitor for symptoms (fever, headache, vomiting) for 21 days after traveling to areas with active outbreaks.

Conclusion

Ebola virus infection has been a serious threat to human individuals due to its highly infectious and lethal behavior since it was discovered in 1976. Ebola hemorrhagic fever is one of the most identified fatal fever with no specific medication is available. The spreading of disease mainly through the transmission of blood and body fluids from one person to another person due to inadequate hygienic procedures. There is an immediate requirement of conveying the information to the public and conducting training programmers for health care professionals and other hospital staff. The best method to minimize the Ebola epidemic cases is to control the spread of the disease. And more healthcare programmers are required to conducting a large scale for developing the awareness about Ebola virus disease, its preventive measures and eradication process[15]. Extensive research investigations are needed to develop an accurate diagnostic procedure as well as an affordable and easily available medication for the treatment of Ebola virus infection.

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Conflict of Interests

The authors declare no conflict of interest

Ethics Approval

Not applicable

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AI Tool Declaration

The authors declare that no AI and related tools are used to write the scientific content of this manuscript.

Data Availability

Data will be available on request

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